



Glossary of Ironworks, Charcoal, Lime Kiln, and Brick-Making Terms

The following is a list of terms used in association with blast furnaces, bloomery forges, foundries, mining, charcoaling, lime burning, and brick making. Sources include dictionaries, encyclopedias, technical manuals, and professional papers, many of which are included in the Bibliography. While some of the definitions are taken from sources of the time, note that the meanings of some terms changed through the years with the technology.

- Aalborg kiln:** A lime kiln with two vertical inner chambers; also known as a Schöfer kiln.
- Air furnace:** A horizontal reverberatory furnace in which the metal is melted by the flame from fuel burning at one end of the hearth, which passes over the iron toward the stack (chimney) at the other end. See puddling furnace; reverberatory furnace.
- Alloys:** Metallic substances composed of two or more elements and processing properties different from those of their components.
- Ancony:** An unfinished bar of wrought iron, narrow in the middle but thick and coarse at the ends.
- Ankle vents:** The lowest row of vents in a charcoal kiln, at ankle height.
- Anneal:** Heating iron to above a critical range, holding it at that temperature for a required time, and slowly cooling it to make the iron less brittle.
- Annealing pots:** Iron boxes or containers in which castings are packed for protection against the furnace atmosphere during the annealing operation.
- Anthracite furnace:** An iron-smelting blast furnace that uses anthracite coal as its fuel.
- Anvil:** The base of a hammer into which a sow block and die are set; a block of iron or steel on which metal is forged.
- Anvil cap:** See sow block.
- Arch bricks:** Bricks that surround fire holes, or arches, on temporary kilns or clamps.
- Ashlar:** Cut-and-finished stone building blocks.
- Bats:** Broken bricks with one entire end.
- Bear:** A large unmelted mass of furnace charge. See salamander.
- Bellows:** A box with flexible sides in which alternate expansion and contraction draws air through a side valve and expels it through a nozzle.
- Belly pipe:** The air pipe that supplies blast from outside the furnace (from the bellows) to the dropper and bustle pipes from beneath the hearth.
- Bessemer process:** A process of making steel from cast iron through burning out carbon and impurities by blasting air upward through the bottom of the molten metal. It heralded the age of cheap steel in the U.S., beginning in 1865. Because it was not suitable for all iron, it was suspended in the early 20th century by the open-hearth or Siemens-Martin process.
- Billet:** Iron stock with a round-cornered square or rectangular cross-section, to which further processing, such as forging or rolling, is given.
- Binder:** Cross-rods and hardware that hold the blast-furnace masonry from shifting while settling.
- Blackening:** Carbon facing for foundry molds or cores consisting of charred wood, coal, coke, or graphite ground to a powder. See foundry facing.
- Blacksmith:** A smith who forges by hammering (black; the color of the metal). See whitesmith.
- Blast:** A continuous blowing, to which the charge of ore or metal is subject in the furnace.
- Blast furnace:** A tall-shaft variety of furnace operated by forced draft.
- Bloom:** A mass of wrought iron from a Catalan forge or a puddling furnace, deprived of its dross and shaped in the form of an oblong block by shingling; metal that has been somewhat reduced from an ingot by rolling or cogging, but which receives further work by rolling or forging. See loop.
- Bloomer:** One who works blooms at the forge. See puddler.
- Bloomery:** A forge that makes wrought-iron blooms directly from ore, or more rarely from cast iron.
- Bloomsman:** See bloomer.
- Bloom tongs:** See tongs.
- Blow:** The impact or other pressure produced by the moving part of any forging unit.
- Blowing in:** Starting up the blast furnace.
- Blowing out:** Shutting the blast furnace down.
- Blowing tubs:** Blast-producing machinery consisting of water-wheel-driven pistons and cylinders, which replaced bellows.
- Blows:** Trapped gas bubbles in castings, causing voids in the metal.
- Bod:** A cone-shaped lump of clay attached to the end of a stick to close the furnace taphole.
- Bosh:** The bottom inward-sloping surfaces of the furnace cavity.
- Boss:** A projection on the main body of the forging, generally cylindrical in shape.
- Bottom board:** A wood board which acts as a base for the mold.
- Bottom sand:** The layer of sand with clay rammed on the bottom doors of the furnace to form the sloping hearth or crucible bottom.
- Bottom stope:** See underhand stope.
- Brand:** Incompletely charred wood in a charcoal kiln.
- Breast:** Part of the furnace lining connecting the spout with the bottom and made up with a taphole for every heat.
- Breast wheel:** A waterwheel, driven by water passing behind and below the wheel, driving it in opposite direction from the overshot wheel. See undershot wheel.
- Bridge:** An obstruction within the blast furnace that prevents the charge from moving downward.
- Bunny:** A mass of ore, as distinguished from a vein. See horse.

Burnt lime: See quicklime.

Burrs: Bricks that stuck together during heating; also called clinkers.

Bustle pipe: A pipe that partially or fully encircles the stack to supply blast air to two or more tuyeres.

Calcining: Heating to high temperatures without melting, to remove volatile matter. See sinter.

Carbonate of lime: Chemical name for limestone.

Carbon steel: Steel in which the physical properties depend primarily on the carbon content, other elements not being present in appreciable quantities.

Carburize: Adding carbon to low-carbon iron or steel by heating it to above critical range when in contact with some carbonaceous material (charcoal, coke).

Case harden: A method of hardening the surface of the metal.

Casting sprue: See sprue.

Cast iron: An iron containing so much carbon, usually above 1.7 percent, that it is not usefully malleable at any temperature.

Catalan forge: A bloomery that produces wrought iron from ore and has a siliceous bottom lined with charcoal and a tuyere inclining downward. The front is piled with ore and the back with charcoal and the whole covered with a fine mixed ore and charcoal dust moistened with water. So named from the area of Spain (Catalonia) where it evolved.

Caustic lime: See quicklime.

Cement: Mixture of lime, clay, and shale or blast furnace slag that is ground together, heated to fusing, quickly cooled, and ground into powder.

Cementation: A steel-making process dating back to the late 16th century, in which wrought-iron bars were held at high temperature in a closed oven (furnace) in the presence of carbon-rich material (charcoal). If left long enough, the carbon penetrates the iron, converting it to steel.

Cement mortar: Mixture of lime and cement with sand and water. See lime mortar; cement.

Champlain Forge: A modification of the Catalan forge, developed in the Adirondack district of New York, in which blast was preheated.

Char: To reduce to charcoal or carbon by burning in the absence of air.

Charcoal: Carbon prepared from vegetable or animal substances, as by charring wood in a kiln from which air is excluded.

Charcoal furnace: A blast furnace that uses charcoal as its fuel.

Charcoal kiln: Round, rectangular, or conical structures made of brick or stone for charring wood. See kiln.

Charge: A given weight of metal, stone, and/or fuel introduced into a furnace or kiln.

Checkerwork: A firebrick structure built so that the bricks alternate with open spaces, permitting the passage of gases which give heat, or receive heat from the firebricks. See recuperator.

Chill: A properly shaped casting forming part of the entire interior molding surface, intended to draw heat from the molten metal so rapidly it solidifies faster at that point and becomes sound.

Chipping: Removing fins and gates from castings with a chisel; the process of chipping slag and refuse attached to the lining of the furnace after the heat has been run.

Chuffs: See shuffs.

Cinder: Unburned or unreduced charge or fuel.

Clamp: A temporary-type brick kiln; variant of a scove kiln.

Clinker: A brick heated to near or actual melting or vitrifying; also hardened, burned impurities in a lime kiln.

Coal blacking: An iron founder's blacking made from ground coal. See blacking.

Coal off: To cut a forest for charcoal wood.

Cogging: The reducing operation in working the ingot into a billet by the use of a forging hammer or a forging press.

Coke: Residue of coal remaining after high-temperature heating, used as a fuel in furnaces and forges.

Cold blast: Furnace blast at air (outside) temperature.

Cold-short: Metal that is brittle when heated below a red-heat. See hot-short; red-short.

Cold shut: An imperfect junction between two flows of metal in a mold.

Collier: A coal miner or a charcoal maker.

Concrete: Mixture of cement and gravel.

Cope: The upper or top-most section of a flask, mold, or pattern.

Core: A separate part of the mold that forms cavities and openings in castings, which are not possible with a pattern alone.

Crib: Timber framework support or foundation for a structure such as a dam.

Crucible: A vessel with a refractory lining used for melting or calcining iron or steel.

Crucible steel: A type of steel made by melting steel that is made in cementation furnaces in clay crucibles. It produced a better-quality steel with a more even distribution of carbon. The process originated in the 18th century.

Culls: Bricks so defective they cannot be sold.

Cupola: A type of blast furnace for melting metal (as compared to smelting ore), which consists of a vertical cylinder lined with refractory material and provided with openings for the entrance of a blast. In the cupola furnace, metal is melted in direct contact with the fuel.

Cwt: A hundredweight; 100 pounds (or 112 pounds if in long tons). The common unit of weight at an ironworks. See long ton; quarter.

Daub up: The process of applying a mixture of clay and sand to the defective parts of a furnace lining after a heat, to restore the original lining.

Die casting: Pouring metal into a metallic mold or die and holding it there until solidification takes place.

Dies: Steel blocks into which desired impressions are machined, and from which forgings are produced. Forging dies usually come in pairs, with part of the impression in one of the blocks and the balance in the other.

Downcomer: See downer.

Downer: The pipe or chute that conducts blast down to the bustle pipe or tuyere inside an early blast furnace, or draws air down to the charge in a lime kiln.

- Draft:** The stream of air blast delivered by the bellows or air pump that maintains combustion in the furnace.
- Drag:** Lower or bottom section of a flask, mold, or pattern; also called nowel.
- Draw:** See temper.
- Draw bar:** A bar used for lifting the pattern from the sand of the mold.
- Drift:** A mine passageway driven on, or parallel to, the course of a vein of rock stratum.
- Drop forge:** The shape obtained by working metal in a pair of dies to produce the form in the finishing impression under a drop hammer.
- Dropper:** An air pipe that supplies blast from the belly pipe under the hearth to the bustle pipe.
- Dross:** The solid scum that forms on the surface of a metal when molten or melting, largely a result of oxidation, but sometimes dirt and impurities rising to the surface.
- Dumb stove:** A fireless, sheet-metal stove that radiates heat received from a fired cast-iron stove that is usually on the floor below.
- Dump:** The fuel bed and slag that falls out of the furnace when the bottom is dropped after a heat has been run.
- Equalizer:** See windbox.
- Fag-end:** The part of the bloom cut off when cutting it in half by drop hammer.
- Fagot:** Pieces of wrought iron, bundled together, for rolling or hammering at high temperature.
- Fillers:** Ironworkers who charged ore, fuel, and flux into the top of the blast furnace.
- Fin:** See flash.
- Finery:** See refinery.
- Firebrick:** Brick made of highly refractory clays.
- Firebridge:** A short wall inside a reverberatory furnace, made of highly refractory material, which separates the fire from the molten metal.
- Fire sand:** A sand so free from fluxes that it is highly refractory.
- Flash:** The metal that is in excess of that required to fill out the final impression in a pair of dies, and moves out as a thin plate through the parting line of the dies. Also called fin.
- Flash pan:** The machined portion of the die that permits the excess metal to flow through.
- Flask:** A metal or wood box without top and without fixed bottom, used to hold the sand in which a mold is formed. It usually consists of a cope and drag, which remain on the mold during pouring.
- Flop forging:** A forging in which the bottom and top die impression parts are identical, permitting the forging to be turned upside-down during pouring.
- Flume:** An inclined channel for conveying water from a distance to supply power to a waterwheel, turbine, reservoir, etc. See race.
- Flux:** The basic material added to the furnace charge that unites with sand, ash, and dirt during melting to form slag.
- Forehearth:** A stationary covered container directly attached to the furnace, into which the metal flows as fast as melted, and from which it is tapped for distribution.
- Forge:** Usually, a general term that includes a furnace, or a shop with a hearth, where wrought iron is produced directly from the ore, and is rendered malleable. See bloomery.
- Forging:** Metal that has been worked to some definite predetermined shape by a process of hammering, upsetting, or pressing, either hot or cold, or by a combination of several of these processes.
- Foss hook:** An iron rod with a loop at one end and a handle at the other; used at the forge for handling the bloom.
- Foundry:** An establishment in which metals are molded or forged for production of castings.
- Foundry facing:** A ground carbon (coal) material applied to the surface of a sand mold to prevent the molten metal from penetrating and reacting with the sand of the mold. See sea coal.
- Friable ore:** Ore easily crumbled into small pieces. See shot ore.
- Furgen:** A 4-foot-long straight iron rod used for sounding the fire in the bloomery forge. Also called a tempering bar.
- Fuse:** To heat to melting temperature.
- Gabbro:** A dense igneous rock containing low quantities of iron and lime. It was unsuccessfully burned in some 17th-century New England blast furnaces for ore; later used for flux.
- Gangue:** Non-iron mineral matter associated with the ore.
- Ganister (gannister):** A fine-grain quartzite used in the manufacture of refractory brick.
- Gate:** The end of a runner where the molten metal enters the mold.
- German steel:** Also called natural steel, produced by interrupting the refining process in a forge before all the carbon was removed.
- Giant:** A large nozzle used in hydraulic mining.
- Gossan:** Decomposed rock or vein material of reddish or rusty color caused by oxidation (as in a road cut).
- Grampuses:** Four- to five-foot-long tongs for handling the red-hot bloom.
- Grappier:** A form of natural cement made in a lime kiln by sintering clinkers.
- Gray stock brick:** Good bricks but irregular in color.
- Grissel (grizzel) bricks:** Slightly better-burned bricks than place bricks.
- Grizzly:** A coarse screen grating used in hydraulic mining for keeping large stones swept down by the current out of the grizzly box; also, a mechanically actuated type having moving chains, disks, rings, etc.
- Grizzly box:** A large box, usually of wood, to collect ore washed into it, the result of the hydraulic mining process.
- Grizzly elevator:** An ore-washing device operated by a hydraulic giant (nozzle; see giant), consisting of a long, wide chute with an approaching apron, and a short bottom section followed by a long grizzly.
- Grizzlyman:** A miner who operates the grizzly.
- Headrace:** That part of the race that conveys water to the waterwheel. See tailrace.
- Hearth:** The floor or sole of the furnace.

Heat: A stated tonnage of metal obtained from a period of continuous melting in a furnace.

Heat treat: Any operation of heating metal and cooling it in order to bring out desired physical properties.

Helve: The heavy wood boom of a forge hammer, with the hammerhead at one end, being raised by cams at the other end.

Hollowware: As distinguished from flatware, an article that has volume and significant depth (cups, bowls, pots, kettles, etc.).

Horse: A large mass of ore, parallel to the walls of the mine. Also, a large body of useless rock within an ore deposit. See bunny.

Horse whim: See whim.

Hot blast: Furnace blast preheated to 400° F or more.

Hot-short: Metal that is brittle when heated beyond red-heat. See red-short; cold-short.

Hot spruing: Removing castings from gates before the metal has completely solidified.

Hurdle: An outside covering of earth, leaves, or brush that insulates the kiln.

Hydrated lime: Lime that is treated with water after burning in the kiln; forms calcium hydroxide. See lime water.

Ingot: The casting from which the rolled or forged iron is to be produced.

Iron: Fe, atomic number 26, atomic weight 55.847; fourth most common element, second most common metal behind aluminum; a heavy, malleable, ductile, magnetic element that readily rusts in moist air; occurs native in meteorites and combined in most igneous rocks; is the most used metal and is vital in biological processes.

Jigging: Process by which ore and rock are separated after crushing, through mechanical water separation.

Jinker: See whim.

Keystone kiln: A separate-feed-type lime kiln.

Kibble: An ore bucket, or tub, hoisted by means of a waterpowered windlass.

Kiln: A large stove, oven, or furnace of brick, stone, or clay; a heated chamber for hardening, burning, or drying anything.

Kiln scum: See whitewash.

Knee vents: The middle row of vents in a charcoal kiln, at knee height.

Launder: A box conduit (sluice; trough) conveying particulate ore material suspended in water; a refractory trough conveying molten metal. See riffle.

Lime: Product of a lime kiln, made by burning limestone at high temperature without melting it.

Lime kiln: Round or square stone/brick structures for calcining limestone.

Lime mortar: Mixture of slaked lime and sand.

Lime water: An alkaline water solution of calcium hydroxide.

Lining: The refractory material of uniform and ample thickness built up within the furnace or kiln shell to form the container of the charge for melting or calcining.

Long ton: The usual unit of weight for iron: 2,240 pounds.

Loop: A mass of semimolten iron in a pasty condition, gathered into a ball from a bloomery forge or puddling furnace for the tilt (trip-) hammer or rolling mill. Also known as loupe. See bloom.

Loupe: See loop.

Machinability: The property of permitting tooling or finishing by machining.

Machine-cast: Pig iron made by running the blast furnace pig iron directly into open molds.

Malleable: Capable of being hammered or rolled without breaking; ductile.

Malleable cast iron: Originally, a white cast iron of proper composition subsequently rendered malleable by annealing without remelting.

Malms: The best-made bricks for finest quality brickwork.

Marl: Sand, silt, or clay soil that contains a substantial amount of calcium carbonate; sometimes burned in kilns for fertilizer.

Marls: Bricks made from natural clay and lime.

Meiler: A circular mound of cordwood covered with earth and wet leaves, for making charcoal.

Melting loss: The reduction in weight on the part of the metal charged incident to the melting operation.

Melting rate: The hourly tonnage of iron melted in a furnace.

Melting ratio: The proportion of metal weight charged to the fuel weight that is melting in the furnace.

Metallurgy: The art of extracting metals from their ores and refining them, up to the point required by the metal industry.

Minehead: The top of a mining pit or shaft, including the immediately adjacent ground or buildings.

Mold: A body of sand or other heat-resistant material containing a cavity, which when filled with molten metal yields a casting of the desired shape. Also spelled mould.

Mold clamps: Devices used to hold or lock the cope and drag together.

Molding sand: Sand containing sufficient refractory clay substance to bond strongly without destroying the permeability to air and gases when rammed to the degree required.

Mold weights: Weights placed on top of molds while pouring, to offset internal pressure or "floating."

Mortar: Mixture of lime and cement with sand and water. See lime mortar; cement mortar.

Mould: See mold.

Muck bar: Iron bars made at the puddling furnace.

Natural steel: See German steel.

Nowel: See drag.

Ochre (ocher): Earthy, impure iron ore, usually yellow or red, used in the manufacture of paint.

Opencast stope: See overhand stope.

Open-pit mining: The system of extracting ore from the ground by digging deep open holes or pits.

Ore: Metal-containing earthen material in its natural state.

Ore dressing: Treatment of the ore involving physical, not chemical, change such as washing, crushing, concentrating,

- sampling.
- Oven:** A stove, or an arrangement of pipes at the tunnel head, for preheating blast; a stove for roasting ore to remove gases. See recuperator.
- Overhand stope:** Ore mined underground from the roof of the gallery. The excavation is sometimes pyramid-shaped, but it may be any shape as determined by the outline of the ore body. Also called opencast stope, rill stope, shrinkage stope. See stope.
- Over iron:** The iron melted in excess of the amount estimated to cover a day's molding requirement.
- Overshot wheel:** A waterwheel driven by water passing over the top and in front (downstream side) of the wheel. See breast wheel; undershot wheel.
- Parched:** A burnt or scorched surface, as the inside stone walls of a kiln or furnace.
- Parlor-cook stove:** A 19th-century cast-iron parlor stove modified for cooking or baking.
- Parting line:** The dividing plane between the two pair of dies used in forging metal.
- Paviours:** Excellent-quality bricks.
- Pecking bricks:** See place bricks.
- Picked stock:** The best bricks of the lot.
- Pickling:** A solution or bath for treating metal (e.g., passivating).
- Pig bed:** Small, open, sand molds, made in the floor of the foundry near the furnace, to hold the over iron and other waste metal.
- Piggin:** A one-handled vessel or pail, usually of wood.
- Pig iron:** A cast iron that has been run into pigs direct from the blast furnace, so-called because as run from the blast furnace, the iron in the sand molds resembles a sow with suckling pigs.
- Pithead:** See minehead.
- Place bricks:** Bricks made on or near the outside of the baking kiln and not sufficiently burned; intermediate in condition between shuffs and grissels.
- Pot kiln:** An early-19th-century lime kiln, distinctive by its primitive, potbelly appearance.
- Pot metal:** Scrap iron (from old iron pots).
- Press forging:** A forging produced by a mechanical or hydraulic press.
- Prills:** Hardened droplets of metal trapped inside cooled slag, usually retrieved by picking through broken or crushed slag.
- Prop:** The iron post used to rigidly support hinged bottom doors of a furnace.
- Puddle:** To work metal, while molten, into a desired shape with a long iron tool. See loop.
- Puddler:** One who puddles iron. See puddle.
- Puddling:** The process patented in 1784 (England) in which melted cast iron is converted into wrought iron. It ultimately superseded the refining method associated with the charcoal furnace as a cheaper and faster method of making wrought iron. See loop.
- Puddling furnace:** A small reverberatory furnace in which cast iron is converted into wrought iron; an air furnace. See bloomery; forge.
- Pug mill:** An early machine for preparing clay for brick making; also called mud mill.
- Puzzolana:** Lime mixed with volcanic rock; named from where first found, at Pozzuoli, near Vesuvius.
- Quarter:** A quarter of a cwt; 25 pounds (or 28 pounds in long tons).
- Quenching:** Rapid cooling by immersing in air, gas, or liquids.
- Quicklime:** Pure lime, after burning in the kiln, composed of calcium oxide.
- Race:** A natural or constructed watercourse that conveys water to power waterwheels or turbines. See headrace; tailrace; flume.
- Ram:** The moving part of a drop hammer; a press to which one of the dies is fastened.
- Rammer:** A wooden tool with a round mallet-shaped head at one end and a wedge-shaped head at the other, used in packing sand around the pattern.
- Ram off:** A casting defect caused by improper ramming.
- Recuperator:** A refractory checkerwork or other installation, heated by the exhaust gases of a furnace, and through sections or tubes of which air is drawn to provide preheated air for more efficient combustion of the furnace fuel.
- Red-short:** Metal that is brittle when red-hot.
- Refinery:** A furnace with a shallow hearth for converting (refining) pig iron to wrought iron. See puddling furnace.
- Refractory:** Material capable of enduring high temperature without fusing, corroding, or deforming.
- Reverberatory furnace:** A hearth furnace where the flame is drawn over the firebridge and sweeps through the chamber to the chimney. Burning gases heat the stock, roof, and side walls of the furnace, and the radiated heat melts and superheats the metal. See air furnace; puddling furnace.
- Riddle:** A sieve used to sift sand during molding to eliminate large particles of sand or foreign material.
- Riddling:** Waste material rejected after screening.
- Riffle:** Various contrivances, such as blocks and rails, laid on the bottom of the sluice to make a series of grooves to catch and retain grains of ore. See launder.
- Rill stope:** See overhand stope.
- Riser:** A reservoir of molten metal provided to compensate for the internal contraction of the casting as it solidifies; an outlet over a high part of the mold to indicate the level of the molten metal in the mold.
- Rock wool:** A mineral wool made by blowing a jet of steam through molten limestone or through slag, and used chiefly for heat and sound insulation.
- Rolling and slitting mill:** A foundry in which wrought-iron bars were rolled into plate iron, then passed through opposing disc cutters that sheared the plate into long thin rods used primarily by nail makers.
- Rough stock:** Irregular bricks in both color and shape.
- Round furnace:** A round, brick-constructed charcoal kiln.
- Rubble:** Rough stone as it comes from the quarry.
- Rubble ashlar:** Ashlar with a rubble backing.
- Runner:** An enlarged pouring basin or deep channel connecting with gates to bring metal to them.

Salamander: A piece of iron that solidified prematurely and formed an obstruction within the furnace, so called because of its general similarity in shape to a salamander, although usually much larger. Larger pieces were called bears.

Sand-cast pig iron: Pig iron made by running blast-furnace metal into open molds in the sand.

Scab: Imperfection on the surface of a casting due to the breaking away of a portion of the mold sand by the action of the stream of molten iron pouring into the mold.

Scaffold: An accumulation of adherent, partly fused material forming a shelf, or a dome-shaped obstruction, above the tuyeres in a blast furnace, cupola, or the like.

Scaffolding: Formation of scaffold.

Schöfer kiln: See Aalborg kiln.

Scove kiln: A temporary-type brick kiln; also called clamp.

Sea coal: A mineral coal distinguished by the English because it was first found in seacoast veins; also, pulverized bituminous coal used in sand molds. See foundry facing.

Seconds: Bricks sorted from best-quality malms but still used for building fronts.

Shell: A round iron/steel tower, 5 to 8 feet in diameter and 20 to 40 feet high, lined inside with firebrick, and rising above the base of the lime kiln to increase its draft and charge capacity.

Shellmarl: Ancient silt containing substantial amounts of shellfish remains; often burned for fertilizer. See marl.

Shingle: To subject a mass of iron from a bloomery or puddling furnace to the process of expelling cinder and impurities by hammering and squeezing.

Shingler: An ironworker who shingles by hammer, or by machine.

Shippers: Bricks of higher quality than stock bricks, burned and sound, but not perfect in form.

Short: Refuse and clippings discarded during production of castings.

Shot ore: Ore that crumbles easily (friable) into small fragments, from the size of small shot to that of a large pea.

Shrinkage stope: See overhand stope.

Shuffs: Bricks full of cracks due to wind, rain, or frost while they were hot from the kiln. See place bricks.

Siliceous: Containing silica (e.g., limestone).

Sinter: Ore that has been burned, not melted, so as to separate its elements.

Skim gate: An overhead gate so arranged that it skims dirt from the molten iron passing through it and keeps the dirt out of the casting.

Skimmer: A tool used for removing slag from the molten metal.

Skip car: A small car that carries ore, fuel, and flux from storage bins to the top of a modern blast furnace.

Skip hoist: The inclined track on which the skip car is hoisted to the top of the blast furnace.

Slack: Finest screenings of coal produced at the mine; unusable as fuel unless cleaned.

Slag: A low-melting, nonmetallic covering that forms on the surface of molten iron as a result of combining impurities contained in the original charge, including some ash from the fuel and any silica and clay eroded from the refractory lining of the furnace. It is skimmed off prior to tapping the

heat. Slag occurs in virtually every iron-making and iron-working process that involves molten iron.

Slag hole: An aperture in the furnace slightly above the top level of the molten iron, through which the slag is drawn off.

Slag out: Adding flux (limestone) into the furnace.

Slag spout: The channel casting bolted to the furnace serving for the convenient removal of slag coming through the slag hole.

Slake: The process of decomposing through heat and moisture, as in slaking limestone.

Slaked lime: See hydrated lime.

Slaker: A worker who makes hydrated lime.

Slake trough: A water tank for cooling forgings or tools.

Sleepers: Timbers laid in a mine to support ore car tracks.

Slice: An iron bar flattened at one end for use as a fire shovel.

Slice bar: A steel bar with a broad flat blade for chipping or scraping (in breaking up) clinkers.

Slice up: To work a forge fire with a slicing motion.

Slitting mill: A foundry where iron plates and sheets are cut into long narrow rods, suitable for making nails or spikes. See rolling and slitting mill.

Sluice: A constructed waterway fitted with a valve or gate to regulate the flow of water to a turbine or waterwheel.

Sluice gate: A gate or valve. See sluice.

Smith forging: Forgings made by hand on an anvil or under some power hammer without dies, containing an exact finishing impression of the part. Used where the quality does not warrant expenditure for special dies. Also called hand forging or flat die forging.

Smith hammer: Any power hammer where impression dies are not used for the reproduction of commercially exact forgings.

Soft steel: A term sometimes used to designate low-carbon steel.

Sow block: A block of heat-treated iron placed between the hammer anvil and the forging die, to prevent undue wear to the anvil. Also called an anvil cap.

Spall: The cracking off or flaking of small particles of surface metal.

Spout: A channel casting bolted to the furnace that when lined with refractory material forms a continuation of the bottom of the furnace and carries the molten metal from the taphole to the ladles or molds.

Sprue: Part of the die machined out to permit a connection between multiple impressions or between the impression and the forging bar; the metal settled in the gates, risers, runners, and pouring basins of a mold and forming the scrap of a foundry, other than defective castings and over iron.

Sprue cutter: A metal tool used to cut the pouring aperture.

Steel: Iron cast from a molten state containing at least 0.30 percent carbon.

Stock brick: Bricks molded on a stock, a 1/2-inch-thick board nailed to the molding table. The mold fitted around it and held it in place.

Stope: Horizontal underground mining excavation forming one of a series of "steps," from which ore has been removed from the vein. See overhand stope; underhand stope.

Stove black: Blacking (graphite) used for polishing cast-iron

- stoves. Also called stove polish.
- Stuckofen:** An early German blast furnace (stack-oven).
- Stull:** A round timber used to support sides and back walls of a mine working; one of a series of supports wedged between the walls of a stope to hold up a platform; a platform laid on stulls to support miners, ore, or tailings.
- Stuller:** A miner who works at stulls.
- Swage:** A tool used to shape metal by holding it directly on the piece and striking the tool with a hammer.
- Swage block:** A perforated iron or steel block with grooved sides, used to head bolts, and for swaging bars by hand.
- Taconite:** A dense, low-grade (30 percent) iron ore.
- Tailings:** Refuse material separated from the ore as residue during the ore-dressing process.
- Tailrace:** Part of a race that conveys water away from the waterwheel. See headrace; flume.
- Taphole:** Opening in the furnace breast through which molten metal is allowed to run to the spout.
- Taphole plug stick:** See bod.
- Tap-out bar:** A bar that opens the taphole in the furnace.
- Tapping:** Opening the aperture at the spout to permit the molten metal to run from the furnace.
- Teeming:** Pouring steel from a ladle into ingot molds.
- Temper:** Reheating iron after the quenching operation to some temperature below critical range, to produce desired physical properties. Also called draw.
- Tilt hammer:** A heavy drop hammer operated by means of waterwheel and cams, or a small engine. Also called trip-hammer.
- Timp:** See tymph.
- Tipple:** A bridge-like structure on which railroad cars are tipped over to dump their contents (ore, coal, sand) into hoppers or ships below.
- Tonghold:** A small forging projection used to manipulate a casting with tongs during the forging operation.
- Tongs:** Metal holders for handling hot pieces of metal.
- Tool steel:** A superior grade of steel made primarily for use in the manufacture of tools and dies.
- Tote box:** Metal container used to convey forgings to the various foundry-processing operations.
- Tremie:** An apparatus located immediately above the tunnel head of a blast furnace, consisting of a hopper and cone, evenly distributing large and small particles of charge when released into the stack. The tremie also serves to block stack gases from the charging area through its double-door arrangement.
- Trimmer:** The dies used to remove the flash or excess stock from the forging.
- Trip-hammer:** See tilt hammer.
- Trompe:** A device that traps air in water falling through a pipe. Air is sucked through sloping holes in the sides of the pipe and collected in a box at the bottom. The slight pressure of collected air supplies a weak furnace draft.
- Trunnel head:** See tunnel head.
- Tubs:** See blowing tubs.
- Tumbling:** A process for removing scale from forgings in a rotating barrel containing castings and abrasives.
- Tunnel head:** The top of the furnace shaft at its smallest inside diameter. Sometimes called trunnel head.
- Turbine:** An iron wheel-type device that is rotated by impulse of the water on cups or vanes surrounding a central shaft, and connected to machinery.
- Turn-bat:** A piece of wood 2 to 6 inches long by 1½ inches wide, used in the bloomery to jam the handles of a bloom tong open so that the jaws of the tongs keep a firm grip on the bloom.
- Turn-table:** In an underground mine, a simple platform hinged to a hanging wall, raised or lowered by means of a windlass, to enable ore cars to pass to upper or lower galleries.
- Tuyere:** A nozzle, usually made of iron, through which the blast is supplied into the furnace.
- Tymph:** An overhanging stone or water-cooled iron casting inside the hearth that holds stack gases and slag from running out the taphole along with molten iron. Also spelled timp; tym.
- Underhand stope:** Ore mined from the floor of the gallery in which the stope is usually shaped like an inverted pyramid, or sometimes like a rude staircase. Also called a bottom stope. See stope.
- Undershot wheel:** A waterwheel driven by water passing under it and rotating the wheel in reverse from an overshot wheel. See breast wheel.
- Upset forge:** A forging formed by pressure on hot or cold metal between dies operated in a horizontal plane.
- Waist vents:** The upper row of vents in a charcoal kiln, at waist height.
- Warm blast:** Preheated furnace blast less than 400° F.
- Waterwheel:** A wood or iron wheel made to rotate by direct action of water passing over, behind, or under it, and connected by shafts and linkages to drive mill machinery. See breast wheel; overshot wheel; undershot wheel; turbine.
- Wheel pit:** A stone- or concrete-lined channel or enclosure inside which the waterwheel is mounted.
- Whim:** A machine for hoisting ore from a mine, having a large vertical drum on which the hoisting rope is wound, with one or two radiating arms or beams to which a horse(s) may be yoked. Also called a horse whim, whimsey, or jinker.
- Whitesmith:** A smith who finishes and polishes the work, as distinguished from the blacksmith, who forges it.
- Whitewash:** A permanent efflorescence that forms on the inside wall of a lime kiln, caused by too rapid an application of heat; also known as kiln scum. A composition of lime and water for whitening plaster, masonry, or wood surfaces.
- Windbox (equalizer):** A chamber surrounding the furnace at the tuyere level, to equalize the volume and pressure of the air delivered to the tuyeres.
- Wringer:** A 7-foot-long iron bar used to pry the bloom free inside the forge through a side hole.
- Wrought iron:** A malleable iron, aggregated from pasty particles without subsequent fusion. It contains so little carbon that it does not harden usefully when cooled rapidly. Iron made by the puddling process containing iron in fibrous form intermixed with slag.